General

Guideline Title

Management of acute traumatic central cord syndrome (ATCCS). In: Guidelines for the management of acute cervical spine and spinal cord injuries.

Bibliographic Source(s)

Aarabi B, Hadley MN, Dhall SS, Gelb DE, Hurlbert RJ, Rozzelle CJ, Ryken TC, Theodore N, Walters BC. Management of acute traumatic central cord syndrome (ATCCS). In: Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery. 2013 Mar;72(Suppl 2):195-204. [101 references] PubMed

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The rating schemes used for the strength of the evidence (Class I-III) and the levels of recommendations (Level I-III) are defined at the end of the "Major Recommendations" field.

Recommendations

Level III

- Intensive care unit (ICU) management of patients with acute traumatic central cord syndrome (ATCCS), particularly patients with severe neurological deficits, is recommended.
- Medical management, including cardiac, hemodynamic, and respiratory monitoring, and maintenance of mean arterial blood pressure at 85 to 90 mmHg for the first week after injury to improve spinal cord perfusion is recommended.
- Early reduction of fracture-dislocation injuries is recommended.
- Surgical decompression of the compressed spinal cord, particularly if the compression is focal and anterior, is recommended.

Summary

Class III medical evidence supports the aggressive medical management including ICU care of all patients with a spinal cord injury, including those with ATCCS. Class III medical evidence suggests that surgery for ATCCS is safe and appears to be efficacious (in conjunction with medical management) for patients with focal cord compression, or to provide operative reduction and internal fixation and fusion of cervical spinal fracture dislocation injuries. The role of surgery for patients with ATCCS with long segment cord compression/injury or with spinal stenosis without bony

injury remains a subject of debate in the literature. Patient age and comorbidities are important factors when considering surgical treatment for patients with ATCCS.

Definitions:

Rating Scheme for the Strength of the Evidence: Modified North American Spine Society Schema to Conform to Neurosurgical Criteria as Previously Published and for Ease of Understanding and Implementation: Levels of Evidence for Primary Research Question[a]

Class	Therapeutic Studies: Investigating the Results of Treatment	Diagnostic Studies: Investigating a Diagnostic Test	Clinical Assessment: Studies of Reliability and Validity of Observations, Including Clinical Examination, Imaging Results, and Classifications
I	High-quality randomized controlled trial with statistically significant difference or no statistically significant difference but narrow confidence intervals	Testing of previously developed diagnostic criteria on consecutive patients (with universally applied reference "gold" standard)	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä¸ statistic ≥0.60 or an intraclass correlation coefficient of ≥0.70
	Systematic review[b] of Class I randomized controlled trials (and study results were homogeneous[c])	Systematic review[b] of Class I studies	
II	Lesser-quality randomized controlled trial (e.g., <80% follow-up, no blinding, or improper randomization)	Development of diagnostic criteria on consecutive patients (with universally applied reference "gold" standard)	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä¸ statistic of 0.40–0.60 or an intraclass correlation coefficient of 0.50–0.70
	Prospective[d] comparative study[e]	Systematic review[b] of Class II studies	
	Systematic review[b] of Class II studies or Class I studies with inconsistent results	Study of nonconsecutive patients; without consistently applied reference "gold" standard	
	Case-control study[g]	Systematic review[b] of Class III studies	
	Retrospective[f] comparative study[e]	Case-control study	
	Systematic review[b] of Class II studies		
III	Case series[h]	Poor reference standard	Evidence provided by 1 or more well-designed clinical studies in which interobserver and intraobserver reliability is represented by a Ä¸ statistic of <0.40 or an intraclass correlation coefficient of <0.50
	Expert opinion	Expert opinion	

[a]A complete assessment of quality of individual studies requires critical appraisal of all aspects of the study design.

[b]A combination of results from 2 or more prior studies.

[c]Studies provided consistent results.

[d]Study was started before the first patient enrolled.

[e]Patients treated 1 way (e.g., halo vest orthosis) compared with a group of patients treated in another way (e.g., internal fixation) at the same

institution.

[f]The study was started after the first patient was enrolled.

[g]Patients identified for the study on the basis of their outcome, called "cases" (e.g., failed fusion), are compared with those who did not have outcome, called "controls" (e.g., successful fusion).

[h]Patients treated 1 way with no comparison group of patients treated in another way.

Levels of Recommendation

Level I	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires Class I evidence which directly addresses the clinical questions or overwhelming Class II evidence when circumstances preclude randomized clinical trials)
Level II	Recommendations for patient management which reflect moderate clinical certainty (usually this requires Class II evidence or a strong consensus of Class III evidence)
Level III	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Acute traumatic central cord syndrome (ATCCS), including:

- Hyperextension injuries superimposed on spinal stenosis
- Fracture subluxations
- Acute disc herniation
- Spinal cord injury without any radiographic abnormality

Guideline Category

Management

Treatment

Clinical Specialty

Critical Care

Neurological Surgery

Orthopedic Surgery

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To update the medical evidence on acute traumatic cervical central cord syndrome (ATCCS) focused on the specific issues of the natural history, medical management, and the potential surgical treatment of ATCCS

Target Population

Patients with acute traumatic central cord syndrome (ATCCS)

Interventions and Practices Considered

1. Intensive care unit (ICU) management of patients
2. Medical management, including cardiac, hemodynamic, and respiratory monitoring, and maintenance of mean arterial blood pressure at 85 to 90 mmHg for the first week
3. Early reduction of fracture-dislocation injuries
4. Surgical decompression of the compressed spinal cord

Major Outcomes Considered

- Improvement in American Spinal Injury Association (ASIA) motor score
- Functional outcome (ambulation, hand function, bladder function, bowel function)
- Neurological deterioration
- Length of hospital and rehabilitation stay

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Search Criteria

A computerized search of the National Library of Medicine (PubMed) database of the literature published from 1966 to 2011 was undertaken. The medical subject headings "central cord syndrome" yielded 1533 citations, "spinal cord injury combined with central cord syndrome" yielded 421 citations, and "traumatic central cord syndrome" yielded 74 citations. Non-English language citations were excluded.

These search parameters resulted in 29 articles specifically describing the management and outcome of patients with central cervical spinal cord injuries. The reference lists of these articles were searched for any additional articles germane to this topic. A comprehensive, contemporary

bibliography is provided containing 101 citations.

Number of Source Documents

Twenty-nine manuscripts make up the foundation for this updated review and are summarized in Evidentiary Table format (see Table 2 in the original guideline document).

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Rating Scheme for the Strength of the Evidence: Modified North American Spine Society Schema to Conform to Neurosurgical Criteria as Previously Published and for Ease of Understanding and Implementation: Levels of Evidence for Primary Research Question[a]

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Class	Therapeutic Studies: Investigating the Results of Treatment	Diagnostic Studies: Investigating a Diagnostic Test	Clinical Assessment: Studies of Reliability and Validity of Observations, Including Clinical Examination, Imaging Results, and Classifications

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[h]Patients treated 1 way with no comparison group of patients treated in another way.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Selected articles were carefully reviewed by the authors. An evidentiary table was created (refer to Table 2 in the original guideline document) that reflected the strengths and weaknesses of each article.

On occasion, the assessed quality of the study design was so contentious and the conclusions so uncertain that the guideline authors assigned a lower medical evidence classification than might have been expected without such a detailed review. In every way, adherence to the Institute of Medicine's criteria for searching, assembling, evaluating, and weighing the available medical evidence and linking it to the strength of the recommendations presented in this document was carried out.

Articles that did not achieve immediate consensus among the author group were discussed extensively until a consensus was reached. Very few contributions required extensive discussion. Most articles were easily designated as containing Class I, II, or III medical evidence using the criteria set forth by the author group at the initiation of the literature evaluation process (see the "Rating Scheme for the Strength of the Evidence" field).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The current author group was selected for its expertise in spinal surgery (both neurosurgical and orthopedic), neurotrauma, clinical epidemiology, and, in several cases, prior experience with guideline development. The topics chosen for inclusion in this iteration of these guidelines are contemporary and pertinent to the assessment, evaluation, care, and treatment of patients with acute cervical spine and/or spinal cord injuries.

Rating Scheme for the Strength of the Recommendations

Levels of Recommendation

Level	Generally accepted principles for patient management, which reflect a high degree of clinical certainty (usually this requires Class I

I	evidence which directly addresses the clinical questions or overwhelming Class II evidence when circumstances preclude randomized clinical trials)
Level II	Recommendations for patient management which reflect moderate clinical certainty (usually this requires Class II evidence or a strong consensus of Class III evidence)
Level III	Other strategies for patient management for which the clinical utility is uncertain (inconclusive or conflicting evidence or opinion)

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field). All articles provided Class III medical evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate management of acute traumatic central cord syndrome (ATCCS)

Potential Harms

Not stated

Qualifying Statements

Qualifying Statements

- Medical evidence-based guidelines are not meant to be restrictive or to limit a clinician's practice. They chronicle multiple successful treatment options (for example) and stratify the more successful and the less successful strategies based on scientific merit. They are not absolute, "must be followed" rules. This process may identify the most valid and reliable imaging strategy for a given injury, for example, but because of regional or institutional resources, or patient co-morbidity, that particular imaging strategy may not be possible for a patient with that injury. Alternative acceptable imaging options may be more practical or applicable in this hypothetical circumstance.

- Guidelines documents are not tools to be used by external agencies to measure or control the care provided by clinicians. They are not medical-legal instruments or a "set of certainties" that must be followed in the assessment or treatment of the individual pathology in the individual patients we treat. While a powerful and comprehensive resource tool, guidelines and the recommendations contained therein do not necessarily represent "the answer" for the medical and surgical dilemmas faced with many patients.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013 Mar

Guideline Developer(s)

American Association of Neurological Surgeons - Medical Specialty Society

Congress of Neurological Surgeons - Professional Association

Source(s) of Funding

Congress of Neurological Surgeons

Guideline Committee

Guidelines Author Group of the Joint Section of Disorders of the Spine and Peripheral Nerves of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons

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Financial Disclosures/Conflicts of Interest

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices described in this guideline.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available in Portable Document Format (PDF) and EPUB for eBook devices from the Neurosurgery Web site .

Availability of Companion Documents

The following are available:

- Foreword. Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):1. Electronic copies: Available in Portable Document Format (PDF) from the Neurosurgery Web site .
- Commentary. Guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):2-3. Electronic copies: Available in PDF from the Neurosurgery Web site .
- Introduction to the guidelines for the management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):5-16. Electronic copies: Available in PDF from the Neurosurgery Web site .
- Methodology of the guidelines for management of acute cervical spine and spinal cord injuries. Neurosurgery 2013;72(3):17-21. Electronic

copies: Available in PDF from the Neurosurgery Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on July 9, 2013. The information was verified by the guideline developer on October 3, 2013.

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